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<b>(21) International Application Number:</b> PCT/EP99/04076 <b>(22) International Filing Date:</b> 14 June 1999 (14.06.99)  <b>(30) Priority Data:</b> 09/103,248 23 June 1998 (23.06.98) US  <b>(71) Applicant (for all designated States except US):</b> SOCIÉTÉ DES PRODUITS NESTLÉ S.A. [CH/CH]; Case Postale 353, CH-1800 Vevey (CH). <b>(72) Inventors; and</b> <b>(75) Inventors/Applicants (for US only):</b> LECOUTBUX, Claude [FR/US]; 10 Wellington Drive, New Milford, CT 06776 (US). GUICHARD, Hugues [FR/FR]; 14, avenue de Mon Repos, F-71000 Mâcon (FR).  <b>(74) Agent:</b> ELKINGTON and FIFE; Prospect House, 8 Pembroke Road, Sevenoaks, Kent TN13 1XR (GB).		<b>(81) Designated States:</b> AT, AU, BG, BR, CA, CH, CN, CZ, DE, DK, ES, FI, GB, HU, ID, IL, IN, IS, JP, KE, KR, LK, LU, MG, MX, NO, NZ, PL, PT, RO, RU, SE, SG, SK, TR, UA, US, YU, ARIPO patent (GH, GM, KE, LS, MW, SD, SL, SZ, UG, ZW), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GW, ML, MR, NE, SN, TD, TG).  <b>Published</b> <i>With international search report. Before the expiration of the time limit for amending the claims and to be republished in the event of the receipt of amendments.</i>
<b>(54) Title:</b> FLAVOR ENHANCER  <b>(57) Abstract</b>  A process for the preparation of a natural cheese flavor enhancer which comprises incubating a protein, a fat, a protease and lipase in an aqueous medium under conditions suitable for producing a cheese flavor enhancer.		

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## FLAVOR ENHANCER

The present invention relates to a flavor enhancer and more particularly to a natural cheese flavor enhancer which boosts the cheese flavor in cheese containing products.

Currently, natural cheese flavors are made from starting materials such as aged cheese, cheese block or cheese curds which are expensive. Also, it is well known that cheese based raw materials are of variable and unreliable quality. Such starting materials are usually treated with enzymes such as proteases and it is well known that enzyme modified cheese products have an unpleasant bitter flavor. In addition, in some cases, incubation with microorganisms such as Penicillium roqueforti or lactic acid bacteria is carried out for up to 48 hours or more which increases the cost and makes the process rather complicated and time-consuming.

We have now devised a process for the preparation of a natural cheese flavor enhancer with reduced bitterness compared with other enzyme modified cheese products and which eliminates the need for the employment of expensive raw materials. In our process, the starting materials are proteins and fats rather than the more expensive aged cheese, cheese block or cheese curds and, in addition microorganisms are not used.

Accordingly, the present invention provides a process for the preparation of a natural cheese flavor enhancer which comprises incubating a protein, a fat, a protease and a lipase in an aqueous medium under conditions suitable for producing a cheese flavor enhancer.

It should be understood that in this invention, the cheese flavor enhancer is not a cheese flavor in itself: if it is added to a bland product, it does not impart any specific flavor. On the other hand, when the cheese flavor enhancer is added to a cheese-containing product, it enhances the cheese flavor enabling the amount of expensive cheese normally present in the product to be reduced substantially.

Any edible protein or fat may be used in the process of the invention. Preferred examples of protein are whey protein concentrate, lactalbumin or casein, preferably rennet casein, sodium or calcium caseinate. The fat may be an animal

or vegetable fat but preferred examples of fats are corn oil, shortening<sup>®</sup> (partially hydrogenated soybean and cottonseed oils, mono- and diglycerides), heavy cream or butter. If desired, mixtures of proteins and/or mixtures of fats may be used.

5 The amount of protein used may be from 1 to 30%, preferably from 5 to 25% and more preferably from 10 to 16% by weight based on the total weight of the aqueous medium. The amount of fat may be from 5 to 50%, preferably from 10 to 40% and more preferably from 20 to 35% by weight based on the total weight of the aqueous medium.

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If desired, a small amount of whey protein may be added to the aqueous medium, e.g. from 1 to 10% and preferably from 2 to 6% by weight based on the total weight of the aqueous medium. Whey protein is used as a filler and allows to increase the solid content of the cheese enhancer with a limited impact on the flavor and the cost.

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Any protease or lipase may be used in the process of the invention. For example, the protease may be Protease 2A manufactured by Amano Enzyme Co., a neutral protease, e.g. Protease P Amano 6 manufactured by the Amano Enzyme Co., or Neutrase or Flavourzyme manufactured by Novo Nordisk, Inc. A mixture of one or more proteases may be used if desired. The amount of protease used may be from 0.05 to 1.0% and preferably from 0.1 to 0.75% by weight based on the total weight of the aqueous medium.

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25 The lipase may be pancreatic lipase manufactured by Valley Research Inc., pregastric esterase manufactured by Amano Enzyme Co., or a fungal lipase such as Palatase 20,000L manufactured by Novo Nordisk Inc. or any mixture thereof. The amount of lipase used may be from 0.05 to 1.0% and preferably from 0.1 to 0.75% by weight based on the total weight of the aqueous medium.

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The amount of water in the aqueous medium may be from 25 to 75%, preferably from 35 to 65% and more preferably from 40 to 60% by weight based on the total weight of the aqueous medium.

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Salt may be added, if desired, e.g. in an amount of from 0.5 to 5%, preferably from 1 to 3.5% by weight based on the total weight of the aqueous medium.

Other ingredients conventionally used in cheese making may also be added to the aqueous medium, e.g. trisodium phosphate in an amount up to 2% and preferably from 0.5 to 1.5%, a fungicide such as sorbic acid or potassium sorbate in an amount up to 0.5% and preferably from 0.05 to 0.25% by weight, and a thickener or stabilizer such as xanthan gum, guar gum or carrageenan, etc. in an amount up to 0.50% and preferably from 0.02 to 0.2% all amounts being by weight based on the total weight of the aqueous medium.

The incubation is conveniently carried out in a reaction vessel, such as an incubator. The ingredients are loaded into the reaction vessel, preferably in the following order: the water is introduced first followed by the protease, then the proteins, then the lipase and finally the fats. Advantageously, the trisodium phosphate and the salt are added with the water while the fungicides, thickeners and/or stabilizers are preferably added after the addition of the proteins but before the addition of the fats.

The temperature of the incubation may be from 37° to 48°C (100° to 117°F) and preferably from 39° to 46°C (104° to 113°F).

The pH of the incubation may be from 4 to 6, preferably from 4.5 to 5.5.

The duration of the incubation may be from 12 to 48 hours, preferably from 18 to 36 hours. The incubation is carried out in the absence of any added microorganism.

After incubation, the pH may be adjusted to 4.2-4.4, preferably with phosphoric acid.

After incubation, the product is advantageously homogenized and then pasteurized, e.g. at a temperature from 90°C to 100°C for a period of from 2.5 to 10 minutes, preferably at a temperature from 94°C to 99°C for a period of from 4 to 8 minutes. After pasteurization, the product is conveniently cooled, e.g. to a temperature of from 4° to 10°C to give a product having the consistency of a paste.

The product may be used as a paste or dried and used as a powder. The drying is preferably achieved by spray drying, using a carrier, for instance, maltodextrin in an amount of from 20 to 40% by weight based on the weight of the paste. The moisture content of the final powder is usually from about 2.0 to 4.0% by weight.

The natural cheese flavor enhancer produced by the process of the present invention may be used to enhance the flavor of cheese-containing products such as cheese sauces, cheese dips and salad dressing.

The present invention therefore also provides a cheese-containing product containing an effective amount of the natural cheese flavor enhancer obtainable by the process of the present invention.

The amount of the natural cheese flavor enhancer added to the cheese-containing product may be from 0.1 to 5%, preferably from 0.25 to 2.5% and more preferably from 0.5 to 1.5% by weight by weight based on the total weight of the cheese-containing product.

## EXAMPLES

The following Examples further illustrate the present invention. Parts and percentages are given by weight except where stated.

### Example 1

50 parts of water are mixed with 0.35 parts of Protease 2A, 2.229 parts of NaCl and then 1 part of trisodium phosphate and loaded into a 500 gallon liquefier. This is followed by in order of addition: 4.244 parts of sweet whey, 13.5 parts of rennet casein (30 mesh), 0.1 part of potassium sorbate, 0.05 parts of xanthan gum (Keltrol RD), 0.35 parts of pancreatic lipase and 28.177 parts of butter. The ingredients are ground and then pumped to a 300 gallon reaction tank jacketed with water at 45°C (113°F), and incubated for 24 hours. After incubation, the pH is adjusted to 4.2-4.4 with phosphoric acid.

The product is then piston homogenized at 500 psi. The homogenized mixture is pumped to a plate heat exchanger and pasteurized at 95°C (203°F) for 5 minutes in a holding tube, cooled to 4.5°C (40°F) and transported to a filler where it is packaged and stored at 5°C (41°F).

#### Example 2

The cheese content of a cheese sauce normally containing 33% of cheese is reduced to 25%. To 100 parts of the cheese sauce containing 25% of cheese is added 1 part of the natural cheese flavor enhancer prepared in Example 1. The cheese flavor of the cheese sauce containing the natural cheese flavor enhancer is as good as that of the cheese sauce containing 33% of cheese.

**CLAIMS**

1. A process for the preparation of a natural cheese flavor enhancer which comprises incubating a protein, a fat, a protease and a lipase in an aqueous medium under conditions suitable for producing a cheese flavor enhancer.
2. A process according to claim 1 wherein the protein used is a casein, a whey protein concentrate or lactalbumin.
3. A process according to claim 1 or claim 2 wherein the fat used is a vegetable oil.
4. A process according to any of claims 1 to 3 wherein the fat used is corn oil, heavy cream or butter.
5. A process according to any of claims 1 to 4 wherein a mixture of proteins and/or of fats is used.
6. A process according to any of claims 1 to 5 wherein the amount of protein used is from 1 to 30% by weight based on the total weight of the aqueous medium.
7. A process according to any of claims 1 to 6 wherein the amount of fat is from 5 to 50% by weight based on the total weight of the aqueous medium.
8. A process according to any of claims 1 to 7 wherein from 1 to 10% of whey protein is added to the aqueous medium by weight based on the total weight of the aqueous medium.
9. A process according to any of claims 1 to 8 wherein the amount of protease used is from 0.05 to 1.0% by weight based on the total weight of the aqueous medium.
10. A process according to any of claims 1 to 9 wherein the amount of lipase used is from 0.05 to 1.0% by weight based on the total weight of the aqueous medium.



11. A process according to any of claims 1 to 10 wherein the amount of water in the aqueous medium is from 25 to 75% by weight based on the total weight of the aqueous medium.
- 5 12. A process according to any of claims 1 to 11 wherein the ingredients are loaded into the reaction vessel wherein the water is introduced first followed by the protease, then the proteins, then the lipase and finally the fats.
- 10 13. A process according to any of claims 1 to 12 wherein the temperature of the incubation is from 37° to 48°C.
14. A process according to any of claims 1 to 13 wherein the pH of the incubation is from 4 to 6.
- 15 15. A process according to any of claims 1 to 14 wherein the duration of the incubation is from 12 to 48 hours.
- 20 16. A process according to any of claims 1 to 15 wherein, after incubation, the product is homogenized and then pasteurized before cooling to a temperature of from 4° to 10°C.
17. A process according to any of claims 1 to 16 wherein the cheese flavor enhancer is made into a paste or powder.
- 25 18. A process according to any of claims 1 to 17 wherein the moisture content of the final powder is from about 2.0 to 4.0% by weight.
19. A cheese-containing product containing an effective amount of a natural cheese flavor enhancer obtainable by the process of any of the preceding claims.
- 30 20. A cheese-containing product according to claim 19 wherein the amount of the natural cheese flavor enhancer is from 0.1 to 5% by weight by weight based on the total weight of the cheese-containing product.

# INTERNATIONAL SEARCH REPORT

International Application No

PC1/EP 99/04076

## A. CLASSIFICATION OF SUBJECT MATTER

IPC 6 A23L1/23 A23C19/09

According to International Patent Classification (IPC) or to both national classification and IPC

## B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 6 A23L A23C

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 4 708 876 A (YOKOYAMA HITOSHI ET AL) 24 November 1987 (1987-11-24)  column 2, line 35 -column 5, line 3; claims 1,3; examples 1-3	1-3,5-7, 9-11,14, 15,17-20
X	US 4 752 483 A (E. HAGBERG) 21 June 1988 (1988-06-21)  column 5 -column 7; claims 1,9-13	1,2,6,7, 9,11,14, 17-20
X	US 4 595 594 A (C. LEE) 17 June 1986 (1986-06-17)  claim 1; example 2; table II	1,2,6,7, 9,11,14, 15,19,20
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Patent family members are listed in annex.

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Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 5 455 051 A (C. GROESBECK) 3 October 1995 (1995-10-03)  column 5, line 4 - line 17; claims 1-6	1,2,4,6, 7,11, 13-15, 17,18
X	H. JANG: "Fermentation characteristics of cheese slurry prepared from caseinates" KOREAN J. FOOD SCI TECHNOL., vol. 17, no. 5, 1985, pages 389-398, XP002118320 page 389; table 1	1,2,4,6, 7,11,14, 17

# INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No.

PC1/EP 99/04076

Patent document cited in search report		Publication date	Patent family member(s)	Publication date
US 4708876	A	24-11-1987	JP 1670877 C	12-06-1992
			JP 3035895 B	29-05-1991
			JP 61242542 A	28-10-1986
			AU 5641586 A	30-10-1986
US 4752483	A	21-06-1988	NONE	
US 4595594	A	17-06-1986	NONE	
US 5455051	A	03-10-1995	AT 128818 T	15-10-1995
			BR 9401658 A	01-11-1994
			CA 2122320 A	31-10-1994
			DE 69400027 D	16-11-1995
			DE 69400027 T	14-03-1996
			DK 622028 T	29-01-1996
			EP 0622028 A	02-11-1994
			ES 2078823 T	16-12-1995
			GR 3018189 T	29-02-1996